

ZERO TOLERANCE SAFE ROAD FOR NASHIK, MAHARASHTRA

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Abstract—The main aim of this paper is to analyse galloping urbanization and the exponential growth of ridership. This has subsequently led to perilous situations for drivers as well as for pedestrians as the number of accidents over the past years have significantly increased. The study focuses on accident patterns and the root causes of accidents along the selected stretches of road in Nashik city of Maharashtra, India. The rapid growth of population coupled with increased economic activities has favoured the tremendous growth of motor vehicles. Consistently growing vehicular population along with existing road system, violation of traffic regulations are several factors responsible for road accidents. Traffic accidents are caused by a combination of casualties, injuries, and property damage. The study identifies blackspots along selected stretches of roads in Nashik city and investigates possible causes of road accidents. The study identifies the combination of multiple factors primary of which is viewed from the driver perspective and conditions of roads responsible for fatalities on road. The initial data so generated helps to provide suitable measures along these blackspots to control accidents.

Keywords: Road Accidents, Accident Prediction, Road Geometrics, Traffic Volume, Road safety

I. INTRODUCTION

The study indicated that there are more fatalities on the blackspots (Spots on roads vulnerable to accidents of different sorts resulting in fatalities more than 5) compared to other parts of the same road or other roads in Nashik city. In every blackspot, there are more than 5 fatalities registered. The survey was carried out at selected Blackspots like Tapovan crossing, Swami Narayan Chafuli, K.K. Wagh, Bali mandira Rasbihari chafuli, Chehdigaon Phata, Datta Mandir, Shinde Gaon, Fame Signal, Tarwala Nagar Signal, Nandur Naka Signal, CBS Signal, Mirchi Hotel Signal, Rau Hotel Chowk Signal, Karbon Naka, Sharanpur Road Signal, Old Gangapur Naka Signal, Dwarka Signal and Siddhivinayak Chowk and

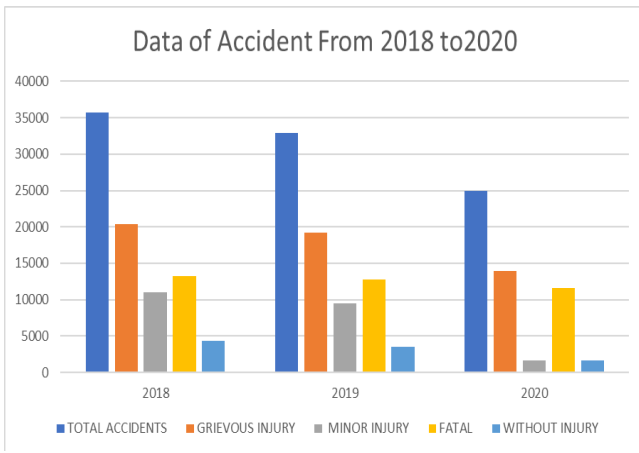
hotspot (Probable spots likely to get converted into block spots in future days). The survey showed that on every black spot a maximum of 5-6 number fatalities has occurred and 11-12 numbers disabilities and grievously injured incidents occurred.

II. LITERATURE REVIEW

Analysis of road accident scenario at Nashik Highways (MAHARASHTRA):

The middle age group of 45-59 years is also very prone to road accident fatality (16). This age group accounts for only 12% of the total population but accounts for 21% of total casualties. A bulk of the road accident fatalities are faced by this population group, which results in less than one-third of the total population. This may be because people in this age group are in their prime working years, and thus are more likely and also to be present on the roads.

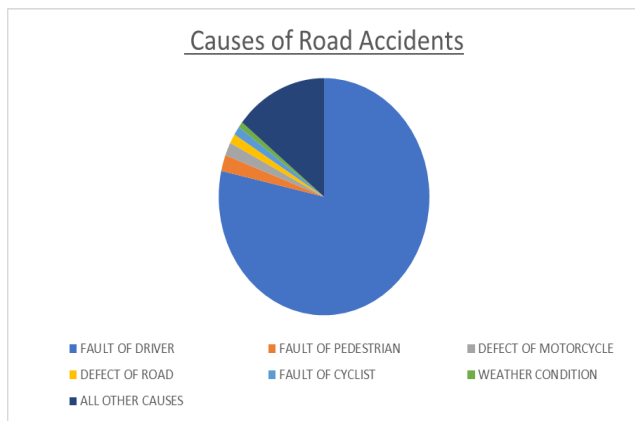
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[Source:<https://highwaypolice.maharashtra.gov.in/wp-content/uploads/2019/12/highway-traffic-book-2018.pdf>]

2.1. Causes of road accidents:

Road accidents data clearly show that drivers’ fault is the single most important factor responsible for accidents on the roads. Drivers’ responses accounted for 78% of total accidents, 76.5% of total injuries and 73.7% of total casualties. Within the category of drivers’ fault in accidents, over speeding, exceeding lawful speed accounted for a high share of 55.6%, intake of alcohol and drugs accounted for 5.3% and 6.4%, respectively of all the accidents that happen. As a contribution of total road accidents and deaths, overloading/jamming of vehicles accounted for 19.6% and 22.8%, respectively. The fault of cyclists and pedestrians appears to be marginal; they account for only 1.2% and 2.2% of total accidents, respectively. The accidents due to defects in motor vehicle conditions and the road condition are also trivial in comparison to drivers’ fault and account for only 1.8% and 0.8% of total road accidents, respectively. (16)



[Source:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3893966/>]

2.2.2. Drunken Driving:

Drunken driving is one of the fundamental causes of road accidents. The statistics show that most of the road accidents on the highways are due to drunken driving only. Globally, some 480,000 deaths and 20 million people get injured by

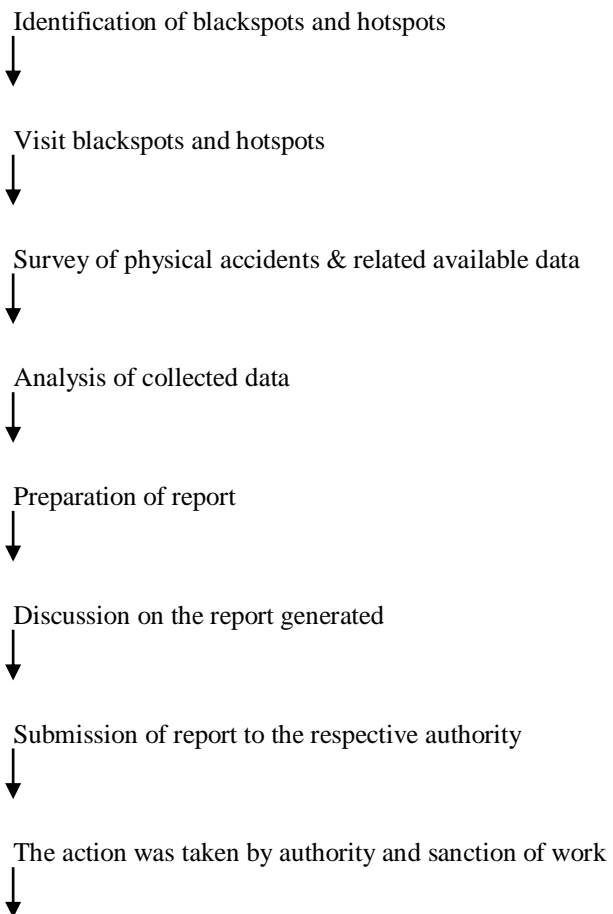
drunk driving every year. In most high-income countries about 20% of fatally injured drivers have excess alcohol in their blood, i.e., blood alcohol concentration (BAC) over the legal limit. (17)

2.2.3. Driver Fatigue:

Driver fatigue is a very dangerous condition created when a person is suffering symptoms of fatigue while driving, often resulting in hypnotic effects, especially during nighttime driving, either falling asleep at the wheel or so exhausted making serious- and fatal-driving errors. The increasing number of traffic accidents due to a diminished driver's vigilance level has become a serious problem for society. Statistics show that 20% of all traffic accidents and up to one-quarter of fatal and serious accidents are due to drivers with a diminished vigilance level. Furthermore, accidents related to driver's hypo-vigilance are more serious than other types of accidents, since sleepy drivers often do not take corrective action before a collision. (17)

III. METHODOLOGY

This study draws attention to gathering information of accidents through respected authorities, studying the causes that may set off accidents. It also deals with studying various suggestions in terms of interventions and applying them according to their feasibility & recommending them to the authorities.



Study post-implementation of the intervention

IV. ANALYSIS OF TYPES OF ACCIDENTS ON ROADS IN NASHIK:

Accident data at the selected back spot are obtained from appropriate authorities are analyzed. The results are tabulated in table No 1

Table No 1: Black spots and fatalities

Sr. No	NH No	Location of the black spot	Name of jurisdictional Police Station	year	Fatal accidents	Grievously Injured accidents	Grievously Injured	Minor Injured	No. of Fatalities	Reason for Frequent Accidents
					No. of accidents year. 1/4/14 to 31/3/19		No. of the person injured			
1.	NH 60	Tapovan Crossing	Panchvati	01/10/15 To 30/09/18	2	4	5	0	2	Junction
2.	NH 60	Swaminarayan Chaufuli	Adgaon	01/10/15 To 30/09/18	2	3	4	1	3	Junction
3.	NH 60	K.K. Wagh College	Adgaon	01/10/15 To 30/09/18	5	10	13	4	6	Cross Speed Limit
4.	NH 60	Bali mandir Rasbihari Chaufuli	Adgaon	01/10/15 To 30/09/18	4	3	5	0	3	Junction
5.	NH 160	Chehdigaon Phata	Nashik Road	01/10/15 To 30/09/18	3	5	9	2	3	Sharp Curve Road
6.	NH 160	Datta Mandir Signal	Nashik Road	01/10/15 To 30/09/18	1	5	5	1	1	Cross Speed Limit
7.	NH 160	Shinde Gaon	Nashik Road	01/10/15 To 30/09/18	8	6	11	4	9	Sharp Curve Road
8.	NH 160	Fame signal	Upnagar	01/10/15 To 30/09/18	5	3	1	4	5	Cross Speed Limit
9.	Dindori road	Tarwalanagar Signal	Panchvati	01/10/15 To 30/09/18	2	7	11	0	2	Cross Speed Limit
10.	Aurang	Nandur	Adgaon	01/10/15	4	7	7	0	4	Cross Speed Limit

	abad road	Naka Signal		To 30/09/18						
11.	Old Agra Road	CBS Signal	Sarkar Wada	01/10/15 To 30/09/18	0	7	8	1	0	Cross Speed Limit
12.	Aurang abad road	Mirchi Hotel signal	Adgaon	01/10/15 To 30/09/18	1	8	13	2	8	Cross Speed Limit
13.	Peth Road	Rau hotel Chowk signal	Masrul	01/10/15 To 30/09/18	9	2	3	0	6	Cross Speed Limit
14.	MIDC Satpur	Carbon Naka	Satpur	01/10/15 To 30/09/18	6	5	6	0	6	T Junction
15.	Satpur Road	Sharanpur Road Signal	Sarkar Wada	01/10/15 To 30/09/18	2	5	7	1	2	Cross Speed Limit
16.	Gangapur road	Old Gangapur Naka Signal	Sarkar Wada	01/10/15 To 30/09/18	2	4	5	0	2	Cross Speed Limit
17.	NH 60	Dwarka circle	Bhadrakali	01/10/15 To 30/09/18	6	3	6	1	7	Round junction and cross speed limit
18.		Siddhivinayak Chowk	Adgaon	01/10/15 To 30/09/18	6	3	6	1	7	junction and cross speed limit.

[Source: Report of RESILIENT India—Rajeev]

V. ROAD SAFETY MEASURES AND INTERVENTIONS ON DIFFERENT CATEGORIES OF ROADS:

Some of the measures that are suggested for the severe accident category are rumblers, speed breakers, speed limit signboards, cat eyes, and blinkers.

As for the moderate accident category interventions like cat eyes, rumblers, speed breaker, and signals is suggested.

For the mild accident category, rumblers, delineators, blinkers and speed limit signboards can satisfy and reduce or stop fatalities.

5.1 Sample Intervention for different categories of roads:

5.1.1. Sant Narhari Chowk, Trimbak Road / Shinde Gaon, Nashik Road - 38 (Severe)

https://drive.google.com/file/d/10BTYTV0CwH_DmVSHW9H_cZvfJWGCOflB/view?usp=sharing

Suggested interventions: Delineators, Rumblers, Cat eyes, Road signs, multiple Speed breakers

Sant Narhari Chowk and Shinde Gaon fall in the severe category as 38 fatalities and accidents are noted here. On examination of the accident pattern and reason for the accident, it was found necessary to introduce some interventions which were found suitable. The usage of highways is prone to more fatalities and major accidents. Interventions suggested above are found to be very necessary, which will reduce the speed of the vehicle considerably.

5.1.2. Tarwala Nagar Signal, Panchavati - 22 (Moderate)

<https://drive.google.com/file/d/1kvq2dn95MZJsgMwNmYu10qTj058IGh3k/view?usp=sharing>

Suggested interventions: cat-eyes, Natural barrier

The above blackspot falls under the moderate category. The fatalities and accidents between 20 - 30 are considered moderate. There are 22 fatalities and accidents are noted here. Interventions were necessary to control accidents. The usage of roadways is prone to a smaller number of deaths and major injuries. Cat eyes provide effective night guidance. A natural barrier is the fastest way to work on the intervention.

5.1.3. Swami Narayan Chaufuli, Adgaon - 13 (Mild)

https://drive.google.com/file/d/1yTYf5113MXyT0iI9TTgQEzOn_piuLCo6/view?usp=sharing

Suggested interventions: Delineators, Rumblers, Blinker, Zebra crossing

The physical examination and analysis of data of the accident show that Swami Narayan Chaufuli falls under the mild category. The fatalities and accidents below 20 are considered moderate. There are 13 fatalities and accidents are noted here. The usage of roadways like chaufuli is prone to fewer accidents and minor injuries. Delineators alert pedestrians, drivers and it is effective in night guidance. It is felt that these interventions will create a difference in driving patterns resulting in a reduction of fatal injuries and death.

VI. DISCUSSION ON THE STUDY:

The study shows that there are major three types of accident categories, i.e., severe, moderate and mild accidents. In the scale, fatalities and minor accidents above 30 lie under severe, between 20 -30 numbers of major-minor accidents lie under moderate and below 20 numbers of fatalities and minor accidents lie under mild accident category.

In the severe accident category, observed accidents have more than 30 numbers of fatalities and minor accidents have happened. Such spots having more accidents have been identified as K.K. wagh college, Shinde gaon, Tarwala Nagar and Mirchi hotel signal. The main reason for the fatalities is over speeding and sharp curves along the roads. Breaking driving rules is generally done by youngsters and age groups 18-59 years. Interventions that can be provided to prevent accidents are Delineators, Rumblers, Blinker, Zebra crossing

In the moderate category fatalities and minor injuries occurred in between 20-30 numbers. Chehdigaon Phata, Tarwalanagar Signal, Nandur Naka Signal, Rau hotel Chowk signal, Carbon Naka, Dwarka circle, and Siddhivinayak Chowk are identified in the moderate accident category, with 3-4 fatalities and 6-7 minor injuries every year from 2015 to 2018. The physical survey revealed fatalities occurred due to round junctions, speeding and not following the rules. Interventions that can be provided to lower the accident rate in the above spots are cat-eyes, Natural barriers.

In the mild accident category, the numbers of accidents and fatalities occur below 20 numbers. Tapovan Crossing, Swaminarayan Chaufuli, Bali mandir Rasbihari Chaufuli, Datta Mandir Signal, Fame signal, CBS Signal, Sharanpur Road Signal, and Old Gangapur Naka Signal are identified as spots with not more than 2-3 fatalities and 3-4 minor injuries every year from 2015 - 18 as shown in the above table. The main reasons for the fatalities and injuries are T junctions, over speeding and sharp curves. interventions that can be provided are Delineators, Rumlbers, Cat eyes, Road signs, multiple Speed breakers.

VII. OTHER OUTCOME OF STUDY ON ACCIDENTS PATTERN:

Accidents are human errors in making a judgment or taking split-second action. This may be due 1. Human error and taking necessary action at right time, 2, Improper planning of road infrastructure, 3. Deliberate negligence, arrogance, on the part of the driver. Accordingly, accidents may happen due to

1. Mental and physical conditions of driver impairing his ability to take the right decision at the right time. Underage and overage drivers are unable to make a suitable decision at the right time.
2. Road within the city needs to be planned for future traffic growth. Locating intersections into main or important roads to be planned with a high degree of sensitivity. Traffic density on main and important roads may lead to accidents.
3. To prevent accidents of all types and to maintain the safety of road users, road transportation authorities have prescribed traffic rules to be abided by all road users. Ignorance, negligence and over passionate driving without caring for traffic rules and regulations result in accidents. Some of the Interventions suggested for the prevention of accidents on block spots are: -

1. Rumlbers: -Rumlbers help the ones who are driving to know they are approaching intersecting roads. This controls the speed of the vehicle and will enter the intersection with care.
2. Speed Breakers: -Speed breakers are a very effective means to control speed. It helps drivers to slow down their vehicle's speed. A different pattern of speed breaker is provided depending on the intensity, type of road user.
3. Cat Eye: -They provide effective night guidance even under adverse weather conditions. When a vehicle is driven on streets drifting from an

individual road to another, the person who engineers the vehicle will be warned.

4. Chevrons: -It warns when there is a change in direction or narrowing the road. It is a high performer in road safety.
5. Delineator: -It alerts pedestrians, motorists and drivers to road work risks, striping or resurfacing, areas and borders limits. It is effective in night guidance.
6. Signal:- Signals allow road users to safely navigate through an intersection. It allows large volumes of traffic to pass through the network with minimal delay.
7. Blinkers: -Give a proper turn signal at least 100 ft. before turning or changing lanes.
8. Road Signage: -These markers allow drivers to know their speed limit and directions.

VIII. OTHER FACTORS TO PREVENT ROAD ACCIDENTS

Research benefits society by taking an evidence based road to decision making. Road safety research is required for:

1. Developing the right attitude about driving. Many teen accidents are a result of attitude and maturity, not skills or knowledge. Drivers need to commit to practising a responsible attitude about driving. It is thus the attitude, not mere skills which will avert accidents. The driver should be aware that he is not only endangering his life but also of other road users. Hence driving responsibly is key to avoiding accidents on the road.
2. Always wear your safety belt. The primary objective is to minimize fatal injury. Every driver should get into the habit of wearing a safety belt, helmet whenever anyone drives a vehicle.
3. Underage drinking and drug use are illegal. Consuming only one drink or smoking one joint, will have a chemical effect on the brain that can impair judgment and reaction time. Driving under the influence of alcohol, drugs, one's life or the life of a road user will be at risk.
4. Limit passengers. The risk of a lethal crash aggravates with supplementary or additional passengers. When a driver is new, it is best to limit the number of passengers.
5. Limit night driving. The risk of an inevitable crash happening increases three times after sunset due to varied reasons like the intensity of light, poor vision etc. It's better to avoid nighttime driving until one is fully comfortable driving during the day.

6. Keep it slow and safe for starters. Fast-moving, high volumes of traffic can make new drivers feel uncomfortable, so avoid it and prefer sufficient supervised driving experience. Thereafter one can gradually introduce more difficult driving situations, like highway driving, merging and driving in cities.
7. Use of Cell phones on the road. One of the worst habits anyone can get into is talking on a cell phone while driving. Cell phones are for emergencies only. If a cell phone is to be used, pull the vehicle aside safely to the side of the road and use it.
8. Follow Road Signages. Do follow road signages on roadway or highway. Breaking rules on roadways or highways will lead to accidents and fatalities.

8.2. Scope of Road safety

Road safety study is very important from a public safety point of view as almost all of the citizens use the road. The study requires strong, robust and good quality information to formulate road safety policies and interventions. The main objective of any Road safety research is to reduce suffering and losses that occur due to road accidents. A good database on all the relevant information regarding an accident through a detailed reporting system will be vital for research on the development of intervention and its outcome. Research on the impact of intervention with regards to changes in road crashes, deaths and injuries are necessary for implementing such interventions in other parts also. Objectives of Road safety research are:

- Prioritizing road safety as a public health problem.
- Allocation of requisite resources.
- Select appropriate, cost-effective and culture-specific interventions.
- Understanding perceptions on road safety amongst different stakeholders including policymakers, programmed managers and people.
- Undertaking advocacy for road safety.
- Evaluating road safety interventions, activities and programmes, and guiding planning, developing, and implementing road safety activities programmes including monitoring and evaluation.

8.3. Trauma registries

Trauma registries are useful to collect in-depth information on defined and specified components to examine specific factors. In this approach, detailed information is collected from patients seeking care in hospitals. Data from registries can supplement surveillance activities in specific areas. Registries can be established in major academic institutions which have the expertise for conducting registry work.

[Ref : <https://nimhans.ac.in/wp-content/uploads/2019/02/GG-research-framework-for-road-safety-2015.pdf> - Topic 10-11 . For points 5.1, 5.2]

IX. CONCLUSION

Nashik being an educational, industrial and cultural hub has a constantly increasing number of motorists on the road. With increasing motorization, RTIs (Road Traffic Injuries) is an absolute necessity. More than 100 - 150 people sustain different grades of injury from road traffic crashes. Despite the growing burden of road traffic fatalities and injuries, road safety has received insufficient attention at the central, state, and local government levels. The economic and psychosocial impact of RTIs is huge, though unmeasured. Assorted factors are being the reason for accidents. The study has revealed an urgent need for the implementation of the interventions suggested. A systematic study and outcome of each the type of intervention will give a longstanding solution to the traffic safety measure. Also, stringent actions on law violations will be a great support for traffic safety. It is also suggested to eliminate high traffic density situations during peak hours by suitably diverting traffic and effective use of all city roads.

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